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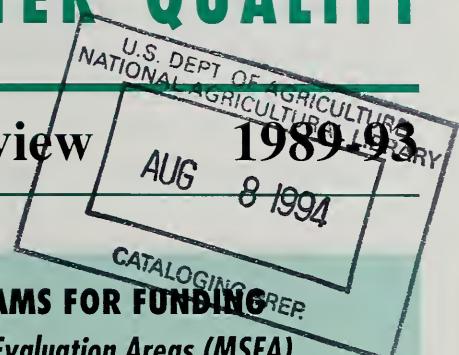


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AGRICULTURAL RESEARCH TO PROTECT WATER QUALITY



Water Quality Special Research Grants Overview

OUR CHARGE

Borne out of Congressional concern to conserve, wisely manage, and protect our natural resources, water quality was elevated to a national priority in the 1980's.

Congress actively endorsed cutting-edge research and innovative technologies to improve the environment and enhance our quality of life by enacting The Special Initiative on Water Quality.

Several Federal agencies share responsibility for implementation of the Initiative. The USDA - Cooperative State Research Service (CSRS), along with the Agricultural Research Service (ARS) and other groups, discussed a variety of water quality concerns affecting environment and natural resource management. Groundwater quality was identified as the major concern and served as the foundation for USDA water quality research goals:

- to determine the extent to which agriculture has affected groundwater quality
- to develop new and improved agricultural systems that enhance groundwater quality and are cost-effective

THE PLAYERS

The CSRS and ARS share responsibility for meeting the Initiative's research goals and are involved in the administration of the Water Quality Research Program. Scientists and engineers from across the country submit research proposals and compete for federally appropriated funds. Professionals and researchers with water quality expertise are selected to serve as proposal reviewers.

The benefit derived from Initiative appropriations has been maximized by encouraging researchers to work jointly with other groups, utilize existing research and demonstration sites for experimental purposes, and conduct projects on a multistate basis, as appropriate.

BEGINNINGS

Congressional funding for the Initiative began in 1990. In an effort to jump-start the Water Quality Special Research Grants Program, CSRS had obtained other funds in 1989 to initiate research efforts. Thus, some research projects were already underway when the Initiative officially began.

TARGETED PROGRAMS FOR FUNDING

Management System Evaluation Areas (MSEA)

- Large-scale studies to demonstrate and better understand the effects of current farming systems on water quality
- Integration of complex soil, weather, water, chemical, economic, and management interactions affecting farm production systems and groundwater quality
- Design and testing of new farming systems that will protect water quality

Nitrogen Testing Grants

- Improvements in current nitrogen tests for crop production
- New nitrogen tests for crop production and for nitrogen leaching potential
- Management recommendations for sustainable farm-scale systems which consider nitrogen available from soils, plants, manure, and other organic material
- Incentives and barriers to adoption of improved nitrogen tests

Water Quality Grants

- Methods to analyze and assess soil, water, and chemical relationships and interactions
- Fate and transport of chemicals in soil and water
- Management practices and remediation methods to reduce contaminants
- Sensors, decision aids, and geographic information systems to enhance the application of chemicals and water
- Social, economic, and policy considerations

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Trends • • • • • • • • • • • • • • • •

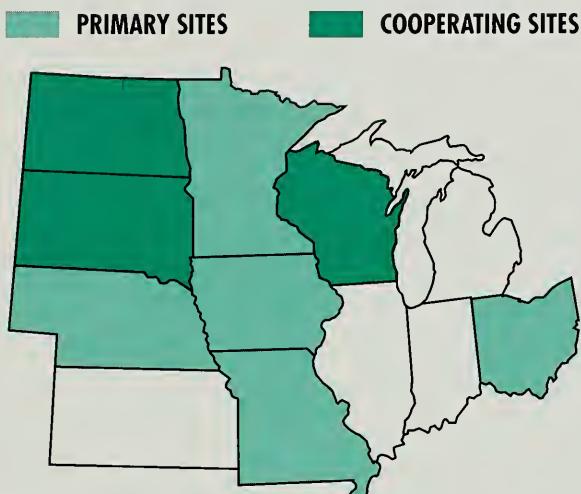
MANAGEMENT SYSTEM EVALUATION AREAS

In 1990, proposals were received from 14 Midwestern States to develop large-scale research projects. Five projects were funded:

Buried Aquifer (OH)
Claypan (MO)
Tile Drainage (IA)

Sand Plain-rainfed (MN)
Sand Plain-irrigated (NE)

CSRS funding for these five projects has averaged \$1.74 million per year.



Coordinating Agencies

- Cooperative State Research Service
- State Agricultural Experiment Stations
- Agricultural Research Service
- Extension Service
- Soil Conservation Service
- Environmental Protection Agency
- Geological Survey

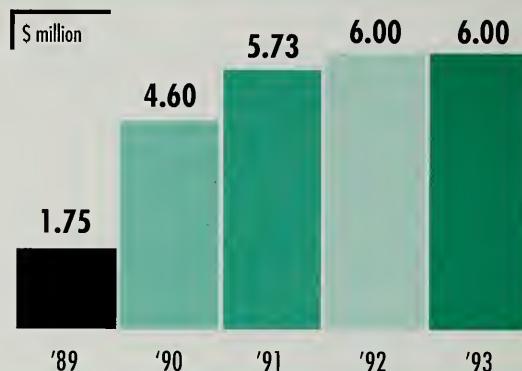
NITROGEN TESTING GRANTS

The nitrogen testing research grant program was initiated in 1992, and jointly funded by CSRS, ARS, and EPA, to address specific research needs in soil testing and fertilizer recommendations. Projects were funded in the summer of 1992 for FY 1992 and FY 1993. Preliminary results from the projects are anticipated in 1993.

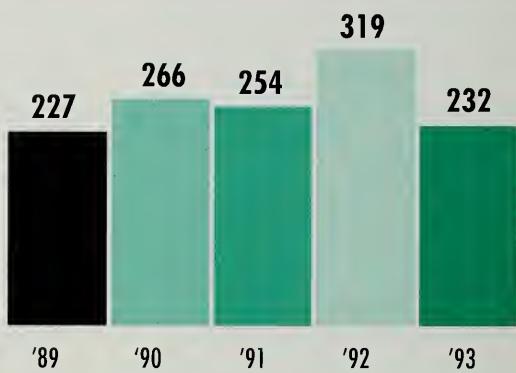
Funds Appropriated:	\$ 1.4 million
Number of proposals received:	91
Number of proposals funded:	25
Size of award	
Average:	\$ 57,814
Minimum:	\$ 51,170
Maximum:	\$ 60,000

WATER QUALITY SPECIAL GRANTS

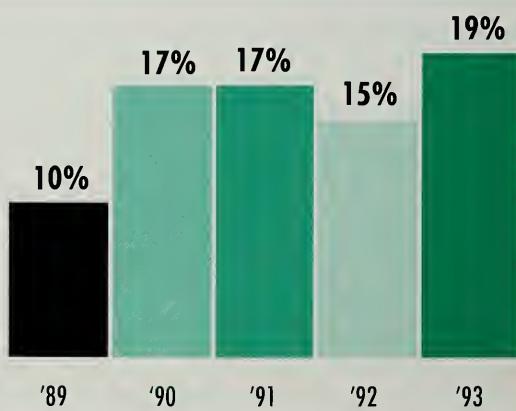
How much of the Congressional appropriations have been available for special grants?



How many proposals have been submitted?



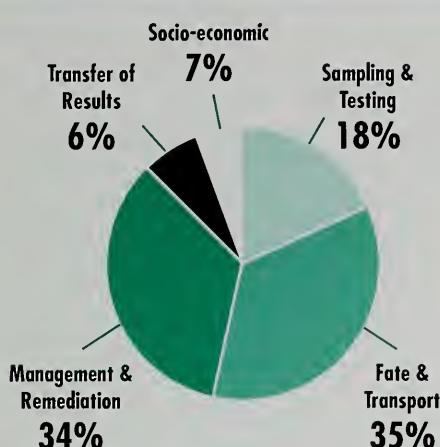
What proportion of submitted proposals have been funded?



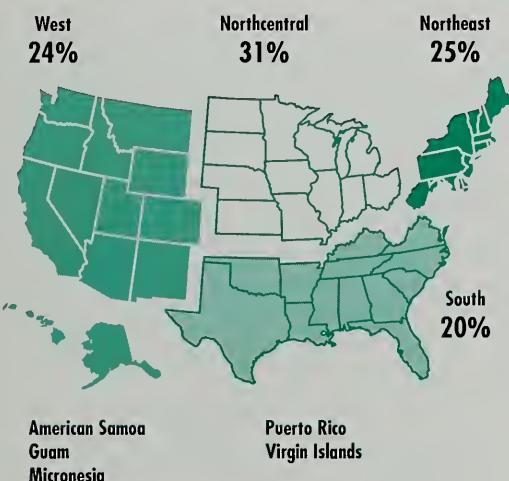
What has been the general funding level for proposals?

FY	'89	'90	'91	'92	'93
	\$ (thousands)/proposal				
Average	76.3	100.3	130.2	127.3	127.7
Minimum	46.0	48.4	34.0	37.6	59.0
Maximum	107.6	149.9	198.0	225.0	150.0

What proportion of the funds has been distributed to each research program area?



What proportion of competitive grant funds have been awarded to each region of the country?



Theoretical and basic research helps us to understand the scientific principles upon which good natural resource management is built.



QUESTIONS AND ANSWERS

What disciplines have received funds under the CSRS Water Quality Special Research Grants Program?

Crop Science	Range Science	Forestry
Soil Science	Chemistry	Economics
Horticulture	Microbiology	Sociology
Animal Science	Hydrology	Geography
Weed Science	Engineering	Mathematics

Proposals from other disciplines and multi-disciplinary research teams are also encouraged.

How many scientists and engineers have served as reviewers to select proposals for competitive funding?

More than 200 scientists and engineers have been involved in the review and selection processes from 1989 to 1993.

Who may submit a proposal under the Water Quality Special Research Grants Program?

Individuals, as well as teams of scientists and engineers, may submit proposals. Groups often submitting proposals include:

- Federal research laboratories
- Land-Grant Universities (1862 and 1890)
- Public and private universities and colleges
- State Agricultural Experiment Stations
- State and local governments
- Private for-profit and not-for-profit organizations
- Veterinary schools

How much funding has been requested by scientists and engineers for research through Water Quality Research Special Grants?

<u>FY</u>	<u>\$ million</u>
1989	17.8
1990	26.2
1991	30.7
1992	44.9
1993	30.7
Total	150.3

Research Results and Impacts

Some water quality research results are already being used by resource managers. However, other research-based technology and information needed to solve real-world water quality problems may take several years to develop.

Below are a few highlights from USDA-CSRS funded projects:

- Most pesticides in runoff water and tile drainage occur during peak flow. Management practices which reduce erosion and runoff will reduce pesticide loading in surface waters. (IA, IN)
- Nitrates in groundwater are often associated with pasture and cropped areas receiving manure (MO), but liquid manure storage also contributes (PA). Adoption of improved manure and pasture management practices will help lower nitrate levels in wells.
- A new chlorophyll meter senses a crop's need for nitrogen, which can be applied in irrigation water on an "as needed" basis, thus reducing fertilizer applications by 40 - 80%. (NE)
- Chemicals (CT, WI, AR, VA), UV light (CT), and microorganisms (MD, PA, ID) can be used to decompose pesticides into harmless compounds. Contamination from rinseate waste and chemical spills may be minimized by applying these new technologies.
- Geographic information systems are being used to identify interrelationships among crop and soil characteristics, residential intensity, taxation, and land use. Comparison of the costs and benefits



Guidelines for agricultural management are developed from applied research.



Teams of farmers, ranchers, scientists, and engineers work together to ensure that new management practices are environmentally safe and economically feasible.

derived from alternative policy options intended to protect ground-water quality will now be possible. (MA)

- Ground-penetrating radar has the potential to detect soil layers most likely to conduct water and chemicals to groundwater. If successful, this technique could help identify locations where solute samples and monitoring wells should be established. (NY, PA)
- Orchards are intensively managed. Options such as cultivation, herbicide application, and killed sod are being studied to determine which alternatives minimize nematicide contamination of groundwater. (WV)
- To help policymakers and producers make more informed decisions, decision aids were improved and used to assess the application of chemicals and predict the movement of water, agri-chemicals, salts, and heavy metals. (CA, CO, GA, HI, IN, UT)
- Alfalfa fixes nitrogen from the atmosphere, but also scavenges for nitrates in soil. Identification of existing and new alfalfa varieties that extract great quantities of soil nitrate will increase our opportunities to provide remediation alternatives on contaminated sites. (MN)
- Tree transplanting equipment is being used as an innovative way to easily and rapidly install instrumentation to collect and monitor water and chemical movement in soil. (MN)
- X-ray computed tomography (CAT-scan) is a promising tool to identify pores in the soil (MO) which control preferential flow (IN, IL, WI) and may be responsible for pesticide and nitrate movement to the groundwater. (MN)
- Nutrient runoff, volatilization, plant use, and leaching are the bases of new guidelines for manure and poultry litter use on soil. (AR)
- A new "high tech" method was developed to detect bacterial pathogens (Salmonella and Shigella) and viral pathogens (poliovirus) in groundwater supplies. (AZ)
- Encapsulating herbicides with starch makes the herbicide less mobile under many tillage systems, but allows it to effectively control weeds. (IN, IL)
- Delaying irrigation until after the application of herbicides allowed for greater chemical dissipation at the soil surface and minimized movement through the root zone. (MT)
- Production cost incentives were found to promote the rapid adoption of environmentally sensitive technologies, if education and technical assistance were also provided. (CA)
- Grass and other vegetative filterstrips can be used to improve surface water quality by intercepting nitrates, atrazine, and phosphorus in runoff water. (KY, NC, VA)
- Socio-economic analysis and geographic information systems were used singly and in combination to better understand how farmers from different regions make decisions that affect water quality. (AR, LA)

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